



## Pathologic Tooth Migration

Lieutenant Commander Yasir Bahrani, DC, USN and Commander Ivan Roman, DC, USN

### Introduction

Tooth position in the mouth is based on an equilibrium that is influenced by multiple factors. Pathologic tooth migration (PTM) is tooth displacement that results when the balance among factors that maintain physiologic tooth position is disturbed by periodontal disease (1). PTM can be disfiguring, can impact patients' self esteem, psyche and often motivates them to seek dental care. In fact, it is the 6<sup>th</sup> most common chief complaint of patients seeking periodontal specialty care (2). The objective of this clinical update is to review the types of PTM, its prevalence, etiology, treatment and prevention.

### Types

PTM can present clinically in different forms including extrusion, facial flaring, rotation, diastema, and drifting of affected teeth. Most patients with PTM appear to have combined forms with the most common being facial flaring and diastema (3, 4). Extrusion, although the least common observed, had the highest average clinical attachment loss, 8.4mm and percent bone loss, 59% followed by facial flaring with 6.0mm and 45% average attachment and percentage bone loss respectively (4).



Photograph of a patient exhibiting diastema, and facial flaring PTM

### Prevalence

PTM is a common finding in patients with periodontal disease (3, 4, 5). In a study of 852 patients receiving care in a periodontal practice a prevalence of 56% in the maxillary anterior sextant was found (5). Towfighi et al., examined 343 patients with moderate to severe periodontitis (defined as having severe bone loss, probing depth, tooth mobility and furcations) and noted a PTM prevalence of 30% (3). In this study, periodontal attachment loss and mobility of migrated teeth were worse than non-migrated teeth. In a more recent study, Costa et al., found 34% of patients with generalized chronic periodontitis to have anterior teeth exhibiting PTM (4). No study

to date has established an age predilection (5) therefore, it is important to know that any patient with periodontal disease is at risk of having PTM regardless of age.

### Etiology

Tooth position depends on the health of the periodontium as well as other factors such as occlusion, pressure of the lips, cheeks, tongue and oral habits (6). It is difficult to determine which of these factors has the most influence in causing PTM but periodontal disease must be present for tooth migration to occur (3, 4, 5). Martinez-Canut et al., found PTM to be associated with advanced periodontal disease and findings of >25% bone loss, loss of 4 or more teeth, and a gingival index of  $\geq 2$ . Their hypothesis is that, as the tooth loses more of its periodontal support, forces can overcome the stability offered by the periodontal attachment (bone, periodontal ligament, cementum and gingival fibers) that keeps the tooth in place (5). Occlusal factors, in particular posterior bite collapse (PBC), have also been identified as potential risk factors for PTM (6, 7). PBC occurs when a posterior tooth is lost without being replaced and consequently leads to a loss of vertical dimension of occlusion (8). Maxillary incisors typically drift facially as the posterior teeth fail to distribute occlusal forces causing forces in excess of what a diseased periodontium can withstand, leading to pathologic movement of the remaining anterior teeth (7). Forces from oral musculature (tongue, lips and cheeks) are also capable of moving teeth due to their long duration and especially after loss of periodontal support (9). While PBC and forces from oral musculature have been associated with PTM, parafunctional habits (bruxism and clenching) have not shown a strong association with PTM (5,6).

### Treatment

Before initiating therapy on teeth exhibiting PTM, their prognosis should be carefully evaluated. Several case series have shown success in treating PTM with periodontal therapy alone (10, 11, 12, 13). Periodontal treatment can induce reactive repositioning (RR) defined as tooth movement that occurs without the use of orthodontic appliances (14) leading to spontaneous resolution of PTM. RR as a result of periodontal treatment occurs within weeks and tends to move rapidly at the beginning of therapy and then slow down (11). RR can be accomplished through surgical and non surgical periodontal treatment according to Gaumet et al., who evaluated RR in 33 PTM cases exhibiting diastemata. In his study partial and complete diastema closure was obtained in 49% and 36% of the teeth respectively after scaling and root planing (SRP). When patients received surgical treatment (Open Flap for Debridement or Guided Tissue Regeneration with Demineralized

Freeze Dried Bone Allograft), 52% of the teeth had complete diastemata closure without additional orthodontic therapy. A higher percentage of complete closure was found if the diastema was small to moderate (<1mm) (10). Other case reports have shown that periodontal therapy alone (non surgical or surgical) can be successful in closing diastemata PTM cases and the results appear to be stable with no relapse at least one year following therapy (11, 12).

In more severe PTM cases, a multidisciplinary approach involving periodontal, orthodontic and restorative treatment is usually required to achieve good results. Re et al., reported successful outcomes on 267 patients with severe periodontitis and PTM where half had SRP and the rest were treated with Modified Widman Flap (MWF) periodontal surgical procedures. In the patients that underwent surgery, orthodontics was initiated one week post-surgery and after orthodontic treatment completion, fixed retention was used. Follow up to 12 years indicated significant improvements in anterior teeth realignment, probing depths and bleeding on probing with only 2 teeth lost during treatment (15). Other case reports have obtained good results with SRP, open flap for debridement and guided tissue regeneration techniques in combination with orthodontic treatment (16, 17, 18, 19). In cases where orthodontic therapy is needed, control of inflammation during active treatment, the use of light forces and fixed retention are recommended (20). Orthodontically moving teeth in the presence of inflammation can result in increased attachment loss (21). Post-surgical periodontal maintenance is therefore imperative in patients undergoing active orthodontic treatment as part of their overall treatment for PTM and case reports have shown that both one and three month recall intervals seem appropriate (15, 18). Fixed orthodontic retention is recommended to reduce the risk of relapse of PTM by better distributing occlusal forces in a treated but reduced periodontium (15).

## Prevention

Prevention of PTM is beneficial because severe PTM can be psychologically destructive and costly often requiring complex and longer treatment time involving multiple disciplines. Since periodontal disease must be present for PTM to occur, prevention and early treatment of periodontal disease is recommended.

## Conclusion

Although prevalence rates vary, PTM is a common finding in patients with moderate to severe periodontitis. It is essential that potential etiologic and contributory factors of PTM are recognized and addressed early. Moderate to severe PTM cases can be successfully treated with a multidisciplinary approach.

## References

1. Newman M, Takei H, Klokkevoeld P, Carranza F. Carranza's Clinical Periodontology, 10<sup>th</sup> edition, St. Louis: Saunders 2006.
2. Brunsvold M, Nair P, Oates TW Jr. Chief Complaints of Patients Seeking Treatment for Periodontitis. J Am Dent Assoc. 1999; 130 (3):359-364.

3. Towfighi P, Brunsvold M, Storey A, Arnold R, Willman D, McMahan. Pathologic Migration of Anterior Teeth in Patients With Moderate to Severe Periodontitis. J Periodontol 1997; 68: 967-972.
4. Costa M, Silverio K, Junior C, Cirelli J. Periodontal Conditions of Teeth Presenting Pathologic Migration. Braz Oral Res 2004; 18 (4): 301-305.
5. Martinez-Canut P, Carrasquer A, Magan R, Lorla A. A Study on Factors Associated with Pathologic Tooth Migration. J Clin Periodontol 1997; 24: 492-497.
6. Brunsvold M. Review: Pathologic Tooth Migration. J Periodontol 2005; 76: 859-866.
7. Greenstein G, Cavallaro J, Scharf D, Tarnow D. Differential Diagnosis and Management of Flared Maxillary Anterior Teeth. J Am Dent Assoc. 2008; 139 (6): 715-23.
8. Shifman A, Laufer B, Chweidan H. Posterior Bite Collapse-Revisited. J Oral Rehabil 1998; 25: 376-385.
9. Proffit W. Equilibrium Theory Revisited: Factors Influencing Position of the Teeth. Angle Orthod 1978; 48: 75-186.
10. Gaumet P, Brunsvold M, McMahan C. Spontaneous Repositioning of Pathologically Migrated Teeth. J Periodontol 1999; 70: 1177-1184.
11. Kumar V, Anitha S, Thomas C. Reactive Repositioning of Pathologically Migrated Teeth Following Periodontal Therapy. Quintessence Int 2009; 40: 355-358.
12. Brunsvold M, Zammit K, Dongari A. Spontaneous Correction of Pathologic Migration Following Periodontal Therapy. Int J Periodont Rest Dent 1997; 17: 183-189.
13. Sato S, Ujii H, Ito K. Spontaneous Correction of Pathologic Tooth Migration and Reduced Infrabony Pockets Following Nonsurgical Periodontal Therapy: A Case Report. Int J Periodontics Restorative Dent 2004; 24: 456-461.
14. Ross IF. Reactive Positioning and Improved Gingival Architecture. J Periodontol 1963; 34: 444-446.
15. Re S, Corrente G, Abundo R, Cardaropoli D. Orthodontic Treatment in Periodontally Compromised Patients: 12- Year Report. Int J Periodontics Restorative Dent 2000; 20: 31-39.
16. Cirelli J, Cirelli C, Holzhausen M, Martins L, Brandao C. Combined Periodontal, Orthodontic, and Restorative Treatment of Pathologic Migration of Anterior Teeth: A Case Report. Int J Periodontics Restorative Dent 2006; 26: 501-506.
17. Corrente G, Abundo R, Re S, Cardaropoli D, Cardaropoli G. Orthodontic Movement into Intrabony Defects in Patients with Advanced Periodontal Disease: A Clinical and Radiologic Study. J Periodontol 2003; 74: 1104-1109.
18. Ghezzi C, Masiero S, Silvestri M, Zanotti G, Rasperini G. Orthodontic Treatment of Periodontally Involved Teeth After Tissue Regeneration. Int J Periodontics Restorative Dent 2008; 28: 559-567.
19. Passanezi E, Janson M, Janson G, Sant'Anna A, de Freitas M, Henriques J. Interdisciplinary Treatment of Localized Juvenile Periodontitis. Am J Orthod Dentofac Orthop. 2007; 131: 268-276.
20. Boyd R, Leggott P, Quinn R, Eakle W, Chambers D. Periodontal Implications of Orthodontic Treatment in Adults with Reduced or Normal Periodontal Tissues versus Those of Adolescents. Am J Orthod Dentofac Orthop. 1989; 96: 1919-199.
21. Wennstrom JL, Stokland BL, Nyman S, Thilander B. Periodontal Tissue Response to Orthodontic Movement of Teeth with Infrabony Pockets. Am J Orthod Dentofac Orthop. 1993; 103: 313-319.

Lieutenant Commander Bahrani is a third-year resident in the Periodontics Program at the Naval Postgraduate Dental School. Commander Roman is the Periodontics Program Director at the Naval Postgraduate Dental School.

The views expressed in this article are those of the authors and do not necessarily effect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government.

Note: The mention of any brand names in this *Clinical Update* does not imply recommendation or endorsement by the Department of the Navy, Department of Defense, or the US Government.